

Utah Energy Forum
September 6, 2007
Draft Notes

Welcome and Introductions

- Education is of prime importance
 - Basis for technology
 - Workforce
 - New ideas

Welcome, Dean Brown

- Energy is a priority at the University & vital to Utah
 - Energy is a major player in many areas including the economy and quality of life for citizens
 - Energy focuses: Heavy Oil, Clean Coal Center, Nuclear Power, Sustainable Energy, Biofuels, CO2 Sequestration, exploration of oil.
 - Collaboration with Governor, industry, other universities
- Engineers are in demand, especially for energy
 - Utah Tech Council
 - Workforce issues is the biggest limiting factor
 - Engineers up 65% from 1999
 - Warnock Engineering Building built to provide space for more programs

Overview of Workforce Services Energy Sector Strategy, Stephen Maas

- We are on the verge of a labor shortage
 - Retiring more skill sets in Utah
- We are partnering with education, industrial sectors to develop workforce
 - Leading in job growth
 - Natural competitive advantage is our workforce (population)
 - Drawing professionals in
 - Encouraging education, including technical education
 - Energy, healthcare, construction, auto/diesel maintenance
 - Asking what the needs are, what skill sets workers need to have
 - Council of councils: includes State & local officials, and Workforce Services

University of Utah, Phil Smith

- Institute of Clean and Secure Energy
 - Multiple disciplines/depth in one area
- Research
 - Formally recognized for their outstanding research
 - Utah clean coal \$2 million
 - Simulated accidental fire and explosions \$3-4 million
 - Utah heavy oil \$2 million
- Energy in a carbon constrained world
 - Increase in energy demand is up 60% from 25 years ago

- Developing nations China and India coming on board
 - As GDP grows so does energy demand and travel increases.
 - Rising costs of oil and gas example
 - Coal is low cost
 - Huge global reserves of coal and unconventional fuels
 - Oil shale and Tar sands
 - Just beginning to tap OS/TS resources
- Issues with fossils
 - Pollutions
 - High cost energy
 - Emissions
 - Literally moving mountains
 - 1995 SO₂ emissions are down, but energy production is up
 - True of all pollutants
 - Electricity generation is up
 - CA land use & CO₂
 - US largest CO₂ emissions,
 - China has scheduled for 2 coal fired, 500 MW, power plants a week
- Chart: Comparisons of known conventional vs. unconventional fuels
- Chart: CO₂ Emissions
 - If we can capture CO₂, we know we can store it underground for long term, at low cost
 - CO₂ storage, and enhanced oil recovery
 - Big problem is how separate CO₂ for coal
 - IOGCC, Oxycoal combustion
 - Chemical looping, MEA, oxygen transport membrane
- CO₂ tax
 - Low cost estimates at \$7/ton in 2010; +5% year
 - High cost estimates at \$25+/ton in 2010; +4% year
- Our charge: is to find low cost solution that developing countries can adopt
- Moving from experimental to theoretical to simulation science
 - Characterization of the resource
 - Production and processing resources
 - Identify legal and environmental issues
 - Business market issues
 - Data and simulation
- Data & Simulation
 - Collection of information, repository
 - Solicited sponsored research
 - Oil shale/Tar sands simulation
 - Water use
 - Upgrading
 - Characterization
 - Legal issues
 - Safety, especially with fire and explosions
- EGI

- Center for nuclear research, radiation effect
- Science with experience, clean, low cost, safety optimized

BYU, Associate Dean John Harb

- Combustion & gasification
 - Coal gasifications
 - Bring facilities & well characterized resource to the table
 - Nitrogen pathways in coal combustion
 - Oil Shale pyrolysis chemistry
 - Chemical structure of Kerogen
- Sustainable Energy
 - Define as 7 generation supply with decreased environmental impact
 - Research Projects
 - Near zero impact coal combustion
 - NOx reduced, black liquor, deposition work,
 - Oxy fuel combustion
 - Black liquor surface temperature, synfuel deposition in gas turbines, turbine accelerated depositing facility, effects of gas temperature
 - Bioprocess engineering
 - Ferment synthesis gas to ethanol
 - Fischer Tropsch (FT) Catalyst
 - Cobalt, iron, Fischer Tropsch consortium
 - Modeling FT synthesis in advanced compact reactors
 - Electrochemical technologies
 - Hybrid electric vehicle
 - Plug in hybrid electric
 - Fuel cell vehicle
 - Lithium ion battery research
 - Fuel cell research
 - Other: oil and reservoir simulation
 - Scatterometry
 - Conceptual/detailed flowpath integration
- Benefits to Universities to the State
 - Fundamental knowledge
 - Strategies and technologies
 - Facilities
 - Business knowledge
 - Graduates

USU, Dean Scott Hinton

- Future energy needs
- Nuclear energy
- Wind energy
- Bio-based energy
- Not focusing on chemical engineering, more on land

- Energy demand for future years
 - Need 13 TW/year, in 2050 need 26 TW/year, in 2100 need 39 TW/year
 - Fossil Fuel: 25 billion metric tons per year
 - Nuclear: 10 TW/year, 1 new fission plant everyday 50 years
 - Terrestrial uranium gone in 50 years
 - Renewables
- Research
 - Plasma containment technology
 - CFD modeling of prismatic gas-cooled nuclear reactors
 - USU renewable energy for rural economic development
 - Wind energy development
 - Economic impact
 - Impact retail energy rates
 - Wind profiling using Lidar
 - Biobased energy
 - USTAR Biofuels team (focus is Algae engineering, agriculture, etc.)
 - Biodiesel R&D
 - 200x more oil vs. soybean
 - Low quality land can be used
 - Cost competitive by 2009
 - Methane from biomass
 - Goal: self-sufficient farm
 - Nutrients and CNG
 - Integrated biofuels and bioproducts
 - Nutrients separated to PHP bioplastic, biodiesel
 - Carbon Sequestration connected with coal plants to create Algae to biodiesel
- Questions on research:
 - How is outreach? We are hoping to get large farms involved
 - How much water consumption? Not a lot going into the project, and it stays there
 - Leftover by-products? Natural products
 - Bioprocessing involves dangerous chemicals but we are working away from that
 - Nuclear
 - We could have in 10 years if not for the recycling part of it
 - Could extend energy for centuries

Audience Questions and Comments:

- How can Utah assist you in moving forward?
 - Besides financing through the legislature, Utah can participate in increased energy production by connecting industry, academia, and government. Still working quite isolated. Connect local government and business
- Do universities work together?

- BYU & U of U chemical engineering have worked quite a bit together, USU is just getting started and their emphasis is more biological.
- Comment: We need to emphasize enhanced coordination, especially among the public sector. Public sector needs to have the facts, the media portrays favorites. We need all energy sectors, all have pros and cons
- Comment: The public perception has a lot of fear. Powerplant locations, NIMBY syndrome. Look at the Sevier plant. Cleaner than IGCC technology. Cleanest plant worldwide so far. Help public understand coal isn't bad.
- Comment: Fund dollars in the universities, it is hard to apply research in this challenging environment. We have to go to Gulf coast, SE Asia, Australia. Difficult to link Government, industry, and research. Policy shift has to happen in Utah to be able to apply research practically. Inform public and legislatures.
- Comment: Newspapers all say coal is dirty. Only way to clear things up is through new technology. NOx is reduced by modern coal plants. Technology solves most problems. We need to phase out old technology. We need ways to recoup costs to get the old out and the new in. Political and economic issues with all fossil fuel utilization.
- Comment: WETC dialogues have changed a lot the last 2 years. Need law passed to mandate energy training & education. Need funding mandate now. Utah laid groundwork. Brought in 60 teachers from all districts for a 3 days super tour of full energy spectrum. If the educators are so unknowledgeable how can we expect the media to be anything other than negative? We should take every teacher on that tour and let them make their own conclusions. Give them the information on all energy. More info on WETC and NEF websites.
- Comment: USTAR component missing. Not being selective but look at all of them. Problem with USTAR is they have no funding for any existing faculty. Need to be able to have teams of existing faculty, fund incentive to get involved. Not paid for work.